

What is claimed is:

1. A polymer composed of saturated alkyl or fluoroalkyl carbon links that connect alternating nitrogen, sulfur or oxygen atoms or connect either an oxygen or nitrogen or sulfur atom through saturated alkyl or fluoroalkyl carbon spacers to oxy-phosphorus (valence III or V) group or an oxy-silicon group, oxyboron or oxyaluminum group or combination of these groups.

2. A polymer as claimed in claim 1 of molecular weight of 200 to 1 million wherein the polymer is comprised of alternating oxygen and nitrogen atoms and the links are saturated alkyl or fluoroalkyl carbon spacers.

3. A polymer as claimed in claim 1 of molecular weight of 200 to 1 million wherein the polymer is comprised of alternating oxygen and sulfur atoms and the links are saturated alkyl or fluoroalkyl carbon spacers.

4. A polymer as claimed in claim 1 of molecular weight of 200 to 1 million wherein the polymer is comprised of alternating sulfur and nitrogen atoms and the links are saturated alkyl or fluoroalkyl carbon spacers.

5. A polymer as claimed in claim 1 of molecular weight of 200 to 1 million wherein the polymer is comprised of alternating oxygen atoms and oxy-phosphorus groups and the links are saturated alkyl or fluoroalkyl carbon spacers.

6. A polymer as claimed in claim 1 of molecular weight of 200 to 1 million wherein the polymer is comprised of alternating oxygen atoms and oxy-silicon groups and the links are saturated alkyl or fluoroalkyl carbon spacers.

7. A polymer as claimed in claim 1 of molecular weight of 200 to 1 million wherein the polymer is comprised of alternating nitrogen atoms and oxy-phosphorus groups and the links are saturated alkyl or fluoroalkyl carbon spacers.

8. A polymer as claimed in claims 2 and 7 wherein the nitrogen atoms are fully or partially substituted with alkyl or fluoroalkyl tertiary substituents.

9. A polymer as claimed in claims 2 and 7 wherein the phosphorus atoms are fully or partially substituted with alkyl or fluoroalkyl tertiary substituents.

10. A polymer as claimed in claims 2 and 7 wherein the nitrogen and phosphorus atoms are fully or partially substituted with alkyl or fluoroalkyl tertiary substituents.

11. A polymer as in claim 1 wherein the spacer links can be two to four carbons in length and can contain alkyl or fluoroalkyl branches.

12. A polymer as in claim 1 wherein the spacer links can have side chain substituents.

13. A solid polymer electrolyte comprising: (i) at least one polymer as in claim 1 and (ii) at least one electrolyte salt.

14. The solid polymer electrolyte as claimed in claim 7 or 8, and 13 wherein the electrolyte salt is selected from an alkali metal salt, a quaternary ammonium salt and a quaternary phosphonium salt or a sulfonylimide or sulfonylmethide in a range of weight ratios to form a polymer electrolyte.

14. A polymer electrolyte as in claim 14 that can be cast as a film.